

UNITED STATES  
DEPARTMENT OF LABOR  
MINE SAFETY AND HEALTH ADMINISTRATION

REPORT OF INVESTIGATION

Underground Metal Mine  
(Platinum)

Fatal Machinery Accident  
April 28, 2005

Stillwater Mine  
Stillwater Mining Company  
Nye, Stillwater County, Montana  
Mine I.D. No. 24-01490

Investigators

Joseph O. Steichen  
Supervisory Mine Safety and Health Inspector

Shane P. Julien  
Mine Safety and Health Inspector

Robert R. Lindeman  
Mine Safety and Health Inspector (Electrical)

Robert V. Montoya  
Mine Safety and Health Specialist

F. Terry Marshall  
Mechanical Engineer

Stephen B. Dubina, Jr.  
Electrical Engineer

Originating Office  
Mine Safety and Health Administration  
Rocky Mountain District  
P.O. Box 25367, DFC  
Denver, CO 80225-0367  
Irvin T. Hooker, District Manager

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## **OVERVIEW**

On April 28, 2005, Cody R. Mathewson, electrician leadman, age 52, was fatally injured when he was crushed between a set of ventilation air lock doors as they closed. Mathewson was working on the power circuit for the doors' control switch, located approximately 15 feet from the doors.

The accident occurred because safe work procedures had not been established and followed before work was performed on the control switch to the air lock doors. The power to the circuit was not de-energized, locked out, or other measures taken to prevent the power circuit from being energized.

## **GENERAL INFORMATION**

Stillwater Mine, an underground platinum operation, owned and operated by Stillwater Mining Corporation, was located near Nye, Stillwater County, Montana. The principal operating official was Frank McAllister, chief executive. The mine normally operated two, 12-hour shifts a day, seven days a week. Total employment was 816 persons.

Ore was extracted using the ramp-and-fill mining method. Sub-level stoping was also done along with cut-and-fill stoping. Mine access drifts were driven at different elevations. Approximately 60 percent of the ore was hoisted to the surface mill through a 1,950-foot vertical shaft. Ore was hauled to the surface by trucks and a rail system that extended about 3 miles. A milling facility was located at the mine site. A smelter and the base metals refinery were located at a company-owned facility in Columbus, Montana.

The last regular inspection of this operation was completed on February 10, 2005. An inspection was ongoing at the time of the accident.

## **DESCRIPTION OF THE ACCIDENT**

On the day of the accident, Cody Mathewson (victim) reported for work at 7:00 p.m., his scheduled starting time. At approximately 9:00 p.m., Mathewson and Jerald Harris, electrician 3, drove a utility truck to the 3500 west 500 dump point air lock doors to complete repairs to the doors' control switch. Mathewson began repairs to the control switch the previous night. When they arrived at the air lock doors, Mathewson positioned the bed of the truck under the control switch to use it as a work platform.

Mathewson asked Harris to go to the electrical panel box, located at the south end of the drift, to lock out and tag out the power source to the control switch for the air doors. Mathewson then stood on the bed of the truck and removed the screws and cover plate on the control switch junction box to access the wiring. When Harris arrived at the panel box, he turned the breaker marked "air doors" to the off position. He was unable to lock the panel box door because his lock would not fit the hasp on the door. He walked back to the utility truck to ask Mathewson how to lock out and tag out the power source. Harris could not see Mathewson or any light from his cap lamp. He looked inside the utility truck cab and walked to the front of the truck. Harris looked toward the air doors and noticed the reflective strip on Mathewson's right pant leg protruding from the door.

Mine emergency personnel were contacted and arrived at the scene a short time later. The county coroner was called and pronounced Mathewson dead at the scene. Death was attributed to crushing trauma.

## **INVESTIGATION OF THE ACCIDENT**

MSHA was notified of the accident at 11:14 p.m., mst, on April 28, 2005, by a telephone call from Steve Wood, safety director, to Irvin T. Hooker, district manager. An investigation was started the same day. An order was issued under the provision of Section 103(k) of the Mine Act to ensure the safety of the miners. MSHA accident investigators traveled to the mine, made a physical inspection of the accident scene, interviewed employees, and reviewed conditions and work procedures relevant to the accident. MSHA conducted the investigation with the assistance of mine management, miners' representatives, and employees.

## **DISCUSSION**

### **Location of the Accident**

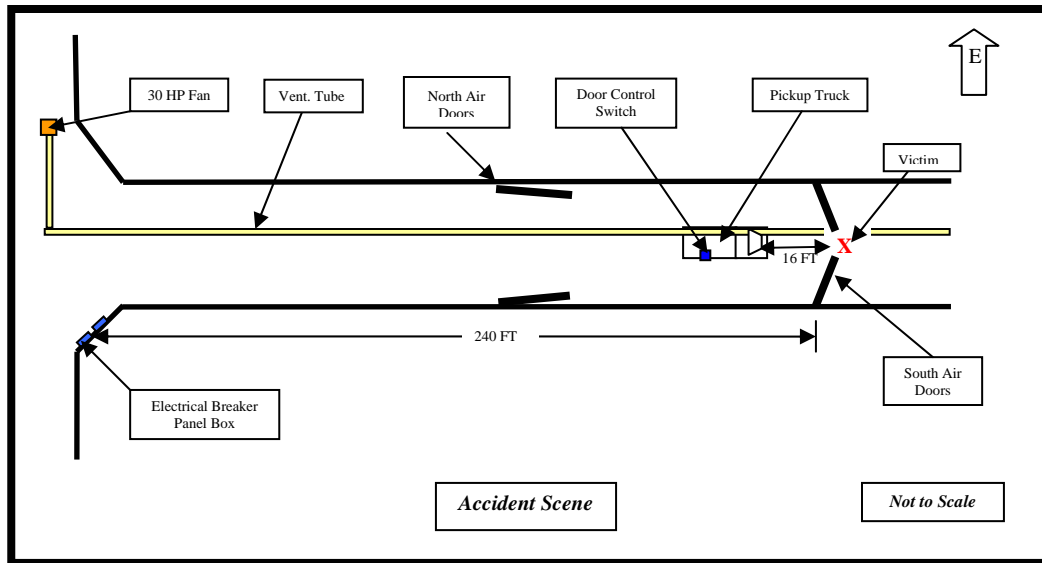
The accident occurred at the 3500 west 500 dump point ventilation air lock doors.

### **Environment**

The location where the accident occurred had approximately four to six inches of standing water. The approximate temperature was 60 degrees Fahrenheit and the humidity was approximately 75 percent. The miners' cap lights and the truck headlights were the only sources of illumination in the area.

### **Air Lock System**

The air lock system at the accident site consisted of two sets of air-actuated metal doors operated by electrical controls. The general direction of the doors within the drift was identified as the north set and the south set. The victim was found pinned in the south set of doors. A sketch of the accident scene is shown in Figure No. 1. Both sets of doors operated independently of each other and had two pull-type control switches suspended in the drift for each set of doors, one on each side of the respective set of doors, to open and/or close that specific set of doors. The north set of doors were open at the time of the accident.



**Figure No. 1**

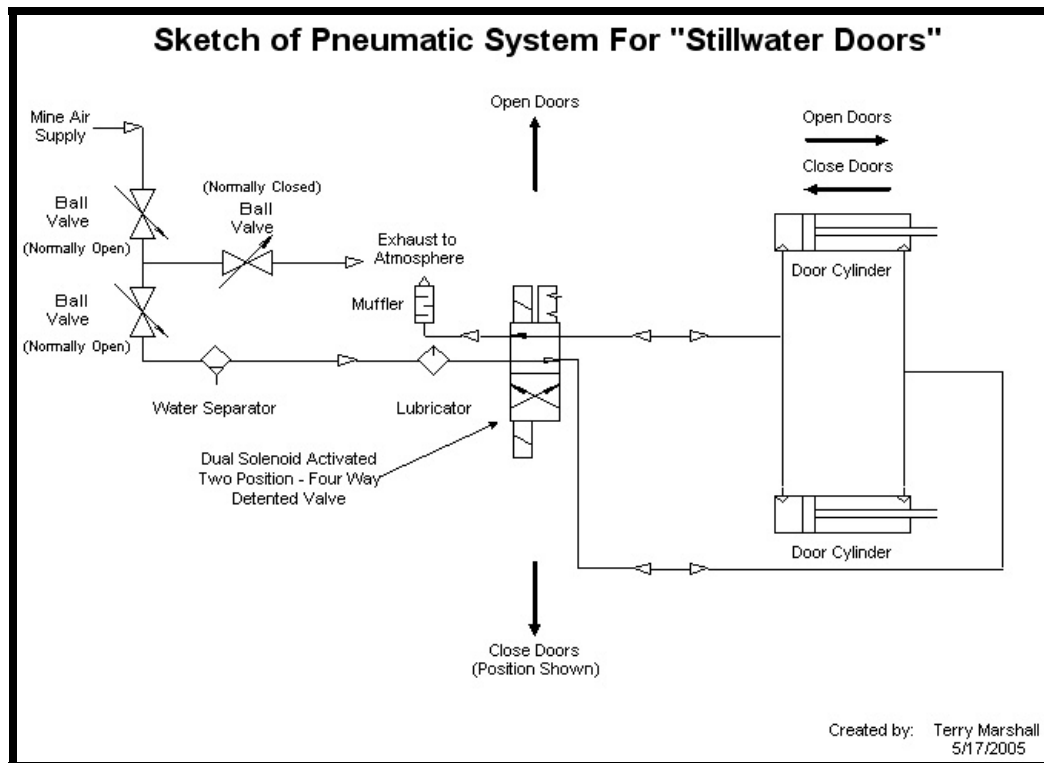
### **Stillwater Doors**

The mine had two types of air lock system designs, an “American” style and a “Stillwater” style. The air lock system design involved in the accident was the “Stillwater” type doors, designed and installed by Stillwater Mining Company personnel.

Each of the two doors, comprising each set, was approximately 5-1/2 feet wide and 10 feet high, and was similar in size and design. Each set had a 26 inch wide by 21-1/2 inch high opening with a sliding door in the bottom panel of a door to allow a person to crawl through.

Air pressure for the system was provided by the compressed air supply for the mine. The control system for the mine’s compressed air system monitored the air pressure and recorded the history of the pressure in the system. Technical data at the time of the accident indicated that there was no disruption of the compressed air supply for the mine.

A sketch of the control system for the pneumatic actuated cylinders is shown in Figure No. 2. Electrically operated solenoids actuated a 4-way, 2-position valve for a door open and a door close position. Constant pressure was provided to the respective side of the pneumatic cylinders even when the doors completed the opened or closed cycle. The cylinders applied a force to the doors at all times during normal operation.



**Figure No. 2**

The pneumatic control system was functionally tested and the control valve was disassembled for visual inspection. No internal leaks were observed during testing that could cause unintended actuation of the door cylinders. No problems were identified with the pneumatic control system or the disassembled control valve that may have contributed to the accident.

Product information indicated that the seven-inch bore cylinder was capable of producing approximately 3,726 pounds of pulling force at 100 pounds per square inch. Using this information, it was estimated that the door edge that pinned Mathewson would have exerted a crushing force of approximately 650 pounds on him.

The cycle time to open and/or close the doors (time lapse between when the pull switch was actuated and when the doors completed movement) was measured to be approximately 15 to 16 seconds, regardless of whether the north set of doors were open or closed and/or if the supplemental ventilation fan was on or off. The west door, of the south set of air lock doors (accident doors); always completed its closing or opening cycle after the east door.

Electrical power to both sets of doors was supplied from a single 15 amp, 120 volt circuit breaker. The breaker was located in a residential-type panel box approximately 240 feet from the doors. The panel box was situated at the main entrance to the drift. A red strobe indicator light was located at each switch location.

The light flashed when the switch was pulled to open the doors and would remain on until the switch was pulled to close the doors. The light bulb was missing at the switch being repaired.

### **Training and Experience**

Mathewson had 30 years mining experience. He had received training in accordance with 30 CFR, Part 48.

### **ROOT CAUSE ANALYSIS**

A root cause analysis was conducted and the following causal factor was identified:

Causal Factor: Management policies and controls were inadequate because lock out/tag out procedures could not be used for all electrical work performed. An electrician had attempted to lock out the circuit breaker for the control switch but the lock issued by management to the electrical crews was not compatible with the electrical panel box. Obvious problems with lock out/ tag out of the smaller, residential type panel boxes were apparent because the locks that were issued would not sufficiently fit these smaller boxes. Work practices and policies stated that the doors were to be blocked against motion and all power sources were to be locked out and tagged out.

Corrective Action: Lock out/tag out procedures should be established that apply to all the various electrical equipment at the mine site. Any locks issues to electricians should be compatible with the panel boxes being locked out. These procedures should also require that any equipment being worked on be blocked against hazardous motion before work is performed. Management and mine employees should conduct a risk assessment analysis before any electrical work is started.

### **CONCLUSION**

The accident occurred because safe work procedures had not been followed before work was done on the control switch to the air lock doors. The power to the circuit was not de-energized, locked out, or other measures taken to prevent the power circuit from being energized.

### **ENFORCEMENT ACTIONS**

**Order No. 7938686** was issued on April 29, 2005, under the provisions of Section 103(k) of the Mine Act:

A fatal accident occurred on April 28, 2005, when an electrician was attempting to repair the air lock doors at the 3500 West 500 dump point. This order is issued to ensure the safety of all persons at this operation. It prohibits all activity in the 3500 West 500 area until MSHA has determined



that it is safe to resume normal mining operations in the affected area. The mine operator shall obtain prior approval from an Authorized Representative for all action to recover and/or resume operations in the affected area.

This order was terminated on May 5, 2005. Conditions that contributed to the accident have been corrected and normal mining operations can resume.

**Citation No. 7938321** was issued under the provisions of Section 104(a) of the Mine Act for violation of 57.12017:

A fatal accident occurred on April 28, 2005, when an electrician was crushed by the closure of a set of air lock doors. The electrician was conducting work on the power circuit for the control switch for the air lock door without having de-energized the power circuit. The control switch was not locked out or other measures taken to prevent the power circuit from being energized.

This citation was terminated on June 21, 2005. All mine employees have been re-instructed in the proper lock out and tag out procedures.

Approved by,

Date: July 22, 2005

Irvin T. Hooker  
District Manager

**APPENDIX A**  
**Persons Participating in the Investigation**

**Stillwater Mining Company**

James L. Phipps	safety manager
Steve Wood	safety director
George L. Zeugel	senior safety coordinator

**Stillwater County Sheriff**

Clifford D. Brophy	sheriff/coroner
Bryan D. Moen	deputy sheriff

**Yellowstone Pathology Institute, Inc.**

Thomas L. Bennett	medical doctor
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**Mine Safety and Health Administration**

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